CLAIMS

1. A directional sound processing system, comprising:

at least first and second microphones spaced apart by a distance, said first microphone producing a first electronic sound signal and said second microphone producing a second electronic sound signal;

a noise level estimate circuit operatively coupled to said first or second microphone, said noise level estimate circuit operates to produce a noise level estimate associated with the first or second electronic sound signal from said first or second microphone; and

a directional processing circuit operatively connected to said first and second microphones and said noise level estimate circuit, said directional processing circuit operates to activated or deactivate directional processing with respect to the first and second electronic sound signals based on the noise level estimate.

2. A directional sound processing system as recited in claim 1, wherein when the noise level estimate is less than a threshold amount, said directional processing circuit deactivates the directional processing.

3. A directional sound processing system as recited in claim 1,

wherein when the noise level estimate is less than a first threshold amount, said directional processing circuit deactivates the directional processing, and

wherein when the noise level estimate is greater than a second threshold amount, said directional processing circuit activates the directional processing.

4. A directional sound processing system as recited in claim 3,

wherein the second threshold amount is greater than the first threshold amount, and

wherein when the noise level estimate is between the first threshold amount and the second threshold amount, said directional processing circuit does not change the activation or deactivation of the directional processing from its previous state.

5. A directional sound processing system as recited in claim 1, wherein said directional processing circuit comprises:

a directional processing control circuit operatively coupled to said noise level estimate circuit, said directional processing control circuit produces a control signal based on the noise level estimate and at least one threshold; and

a signal modification circuit operatively connected to said directional processing control circuit, said signal modification circuit operates to modify the second electronic sound signal in accordance with the control signal.

6. A directional sound processing system as recited in claim 5, wherein said directional processing circuit further comprises:

a combining circuit operatively connected to said signal modification circuit and said first microphone, said combining circuit operates to produce an output signal by combining the modified second electronic sound signal with the first electronic sound signal.

7. A directional sound processing system as recited in claim 6, wherein said directional sound processing system further comprises:

a delay circuit that delays the second electronic sound signal or the modified second electronic sound signal by a delay amount.

8. A directional sound processing system as recited in claim 6,

wherein the control signal is a scaling signal, and

wherein said signal modification circuit is a multiplication circuit that multiplies the second electronic sound signal with the control signal.

9. A directional sound processing system as recited in claim 6, wherein the control signal is one of a logical "1" and a logical "0".

10. A directional sound processing system as recited in claim 6, wherein said combining circuit is a subtraction circuit.

11. A directional sound processing system as recited in claim 1, wherein said directional sound processing system further comprises:

a delay circuit that delays the second electronic sound signal by a delay amount.

12. A directional sound processing system as recited in claim 1, wherein said directional processing circuit comprises:

a directional processing control circuit operatively coupled to said noise level estimate circuit, said directional processing control circuit operates to produce a control signal based on the noise level estimate and at least one threshold; and

a scaling circuit operatively connected to said directional processing control circuit, said scaling circuit operates to scale the second electronic sound signal in accordance with the control signal; and

a subtraction circuit operatively connected to said scaling circuit and said first microphone, said subtraction circuit operates to produce an output difference signal by subtracting the scaled second electronic sound signal from the first electronic sound signal.

13. A directional sound processing system as recited in claim 12, wherein said directional sound processing system further comprises:

a delay circuit that delays the second electronic sound signal or the scaled second electronic sound signal by a delay amount.

14. A directional sound processing system as recited in claim 1, wherein said directional sound processing system resides within a hearing aid device.

15. A directional sound processing system, comprising:

at least first and second microphones spaced apart by a distance, said first microphone producing a first electronic sound signal and said second microphone producing a second electronic sound signal;

a minimum estimate circuit operatively coupled to said first or second microphone, said minimum estimate circuit produces a minimum estimate for the first or second electronic sound signal from said first or second microphone;

a directional processing control circuit operatively coupled to said minimum estimate circuit, said directional processing control circuit produces a control signal based on the minimum estimate; and

a scaling circuit operatively connected to said directional processing control circuit, said scaling circuit operates to scale the second electronic sound signal in accordance with the control signal; and

a subtraction circuit operatively connected to said scaling circuit and said first microphone, said subtraction circuit producing an output difference signal by subtracting the scaled second electronic sound signal from the first electronic sound signal.

16. A directional sound processing system as recited in claim 15, wherein said directional sound processing system further comprises:

a delay circuit that delays the second electronic sound signal or the scaled second electronic sound signal by a delay amount.

17. A directional sound processing system as recited in claim 15, wherein said scaling circuit comprises a multiplier.

18. A directional sound processing system as recited in claim 15, wherein said directional sound processing system resides within a hearing aid device.

19. In a hearing aid device having a multi-microphone sound processing device, a method for dynamically controlling directional processing in the multi-microphone sound processing system, said method comprising:

(a) receiving first and second electronic sound signals from first and second microphones, respectively;

(b) producing a differential electronic sound signal based on the first and second sound signals when an estimated noise level is greater than a first threshold; and

(c) alternatively producing a non-differential sound signal based on the first and second sound signals when the estimated noise level is less than greater than a second threshold.

20. A method as recited in claim 19, wherein the first threshold is greater than or equal to the second threshold.

21. A method as recited in claim 19, wherein the first and second microphones are provided within a hearing aid device, and wherein said method is performed by the hearing aid device.

22. A method for dynamically controlling directional processing in the multi-microphone sound processing system, said method comprising:

(a) receiving first and second electronic sound signals from first and second microphones, respectively;

(b) estimating a noise level picked up by at least one of the first and second microphones; and

(c) dynamically controlling the directional processing based on the estimated noise level.

23. A method as recited in claim 22, wherein said controlling (c) comprises:

(c1) comparing the estimated noise level to at least one threshold level to produce a directional processing control signal; and

(c2) controlling the directional processing in accordance with the directional processing control signal.

24. A method as recited in claim 23, wherein said controlling (c2) comprises scaling one of the first and second electronic sound signals processing in accordance with the directional processing control signal.

25. A method as recited in claim 22, wherein said controlling (c) comprises:

(c1) comparing the estimated noise level to a threshold level to produce a comparison signal; and

(c2) deactivating the directional processing when the estimated noise level is below the threshold level.

26. A method as recited in claim 22, wherein said controlling (c) comprises:

(c1) comparing the estimated noise level to a first threshold level to produce a first comparison signal;

(c2) comparing the estimated noise level to a second threshold level to produce a second comparison signal, the second threshold level being greater than the first threshold level;

(c3) deactivating the directional processing when the estimated noise level is below the first threshold level; and

(c4) activating the directional processing when the estimated noise level is greater than the second threshold level.

27. A method as recited in claim 26, wherein the second threshold level is greater than the first threshold level.

28. A method as recited in claim 22, wherein the first and second microphones are provided within a hearing aid device, and wherein said method is performed by the hearing aid device.

29. A method as recited in claim 22, wherein the noise level is estimate by a minimum estimator.